

Factors Affecting Accessibility of Public Transportation for People Living with Disabilities: Evidence from Bahir Dar City Administration, Ethiopia

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Abstract

The main objective of this study was to examine public transportation accessibility for people with disability. Survey research design specifically cross-sectional survey research design was used and quantitative research approach was adopted. The population of the study was people living with three types of disabilities: persons who are visually impaired, deaf and physically handicapped. One hundred eighty three participants were used for the research. They were selected by using stratified random sampling technique. Data were collected using close-ended questionnaire and analyzed using descriptive statistics and ordered probit model. The results showed that the magnitude of public transport accessibility for people with disability was generally low. More specifically, the mean scores for the dimensions of transport accessibility such as mobility, physical infrastructure and vehicle design, user information and guidelines availability, and regulatory systems were 2.05, 2.10, 1.69 and 2.1 respectively. Relatively speaking, public transport accessibility in relation to network connectivity had a moderate mean score of 2.97. Among the independent variables, network connectivity and income level of the disabled significantly determined accessibility. The result of the study showed that people living with disability had benefitted from the public transportation system in the city because of poor and difficult accessibility of the transportation services. It is recommended that improvement should be made in relation to the mobility dimensions of accessibility, improve physical infrastructure and vehicle design, increase availability of user's information and guidelines, and increase network connectivity and the manner the public transport system is regulated.

Keywords: *Public transport, accessibility, people with disability, factors affecting, Bahir Dar City Administration*

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1. INTRODUCTION

1.1 Background of the Study

Transportation is understood as moving people and goods from one place to another, and thus it is essential in economic development (Closs & Bolumole, 2015). Globally, it is possible to say almost all social and economic activities are transport related. As a result auto dependent transportation system is becoming mandatory for moving peoples and items from place to place. Accessibility of transport has a direct effect on day to day activity of people's life. Access to transportation has great impact on the participation of people in different socio-economic activities in general and people with different types of disabilities in particular (Closs & Bolumole, 2015). Transport plays vital roles in the development of the modern era as an integral part of the socioeconomic and political structure of the country. Thus, urban transport, transport infrastructure, and traffic management should involve optimal integration of the means and ways of mobility to create maximum ease and comfort maintaining the socioeconomic and physical integration of the city (Mulu, 2015). Transportation system is a system consisting of fixed facilities, the flow of entities and the control system that permits people and goods to overcome the friction of geographical space efficiently in order to participate in a timely manner in some desired activity (Rahel, 2017). Also a transportation system provides access to business, social and recreational opportunities, which is fundamental to experiencing a good quality of life. This is especially important for the poor and the fight against poverty (Ethekwini, 2005). Public transport (PT) in urban areas has gained greater attention in recent years for improving sustainability and the quality of urban life. The economic and environmental performance of cities can be enhanced by connecting resources to destinations effectively and facilitating mass mobility (Bok & Kwon, 2016 as cited in Muhammed *et al.*, 2018).

Disability is an umbrella term, covering impairments, activity limitations, and participation restrictions (WHO, 2020). Impairment is an activity limitation and a difficulty encountered by an individual in performing a task or action; a participation restriction experienced by an individual in life situations. Thus, disability is a complex phenomenon, reflecting an interaction between features of a person's body and features of the society in which he or she lives (ADB, 2005 as cited in Eleni, 2016). A vast majority of people with disabilities live in rural areas where access to basic services is limited due to various reasons. According to Mulu (2015), travelling by public transport is subject to constraints such as time, space, money and effort. People living with disabilities have their own contributions to economic growth if the barriers to their economic participation are removed. With more than one billion of persons living with disabilities in the world today, improving their access to public transport is more imperative than ever (Employ Abilities, 2017).

In Ethiopia, 95 per cent of all persons with disabilities are estimated to live in abject of poverty (ILO, 2013). The majority of them depend on family support and begging for their livelihoods. A study in Oromia national region, for instance, found that 55 per cent of the surveyed persons with disabilities depend on family, neighbors and friends for their living, while the rest generate meager income through self-employment, begging and providing house maid services (Cardos, 2007 cited in ILO, 2013) research report on the general conditions of people with disabilities in Ethiopia, Addis Ababa. A reported by WHO (2018) revealed that over a billion people are estimated to live with some form of disability. This corresponds to about 15% of the world's population. Between 110 million (2.2%) and 190 million (3.8%) people 15 years and older have significant difficulties in functioning. Furthermore, the rates of disability are increasing in part due to ageing populations and an increase in chronic health conditions (WHO, 2018). The international classification of functioning,

disability and health (ICF) defined disability as an umbrella term for impairments, activity limitations and participation restrictions. Disability is the interaction between individuals with a health condition (e.g. Cerebral palsy, Down syndrome and depression) and personal and environmental factors (e.g. Negative attitudes, inaccessible transportation and public buildings, and limited social supports).

A report by SIDA (2014) showed there are about 15 million people living with disabilities in Ethiopia, representing 17.6% of the total population at that time. According to the ministry of labor and social affairs (2014), 95% of people living with disabilities in the country experience the abject of poverty. According to the UN (2014) report, by 2050, it is expected that about 6.25 billion people, 15 per cent of whom are persons with disabilities, will be living in urban centers. In addition to this a study carried out in Addis Ababa Ethiopia revealed that: “people who are willing and able to work cannot do so because of inadequate transportation. Others cannot shop, socialize, enjoy recreational or spiritual activities, or even leave their homes. And some individuals with disabilities who need medical services must live in institutions due solely to the lack of safe, reliable transportation to needed medical services (Tessema, 2017) and also social life has been affected so much, due to the difficulty of the environment is not adapted for person with disabilities transportation and environment challenges.

Transportation provides independent access to employment, education, and health care facilities, and to social and recreational activities. Without accessible transportation, people with disabilities are more likely to be excluded from services and social contact. In a study in Europe, transport was a frequently cited obstacle to the participation of people with disabilities. In a

survey in the united states of America lack of transportation was the second most frequent reason for a person with disability being discouraged from seeking work the lack of public transportation is itself a major barrier to access, even in some highly developed countries (WHO, 2011).

Transportation systems can be evaluated in various ways that reflect different perspectives concerning users, modes, land use, transport problems and solutions, how transport activity is measured, and the type of performance indicators used. Three perspectives are traffic, mobility and accessibility. Mobility refers to the movement of people or goods. It assumes that “travel” means person- or ton-miles, “trip” means person- or freight-vehicle trip. It assumes that any increase in travel mileage or speed benefits society. Mobility is measured using travel surveys to quantify person-miles, ton-miles, and travel speeds, plus traffic data to quantify average automobile and transit vehicle speeds. In recent years techniques have become available to evaluate multi-modal transportation system performance, such as transit and cycling level of service (LOS) ratings (Litman,2019).Accessibility (or just access) refers to the ability to reach desired goods, services, activities and destinations (collectively called opportunities). Access is the ultimate goal of most transportation, except a small portion of travel in which movement is an end in itself (Jogging, horseback riding, pleasure drives), with no destination. This perspective assumes that there may be many ways of improving transportation, including improved mobility, improved land use accessibility (which reduce the distance between destinations), or improved mobility substitutes such as telecommunications or delivery services (Hansen, 1959; Litman, 2019).

Accessibility is evaluated based on the time, money, discomfort and risk (the generalized cost) required reaching opportunities. Access is relatively difficult to measure because it can be affected by so many factors. For example, access

to employment is affected by the location of suitable jobs, the quality and cost of travel options that reach worksites, and the feasibility of Timework (which may allow employment for a firm that is physically difficult to reach). Activity based travel models and integrated transportation/land use models are most suitable for quantifying accessibility (Litman, 2011). Affordability refers to households' ability to purchase basic (or essential) goods and services. Transportation affordability refers to the financial burden household's bear in purchasing transportation services, particularly those required to access basic (also called essential) goods and activities such as healthcare, shopping, school, work and social activities. Since affordability refers to household's ability to save money, it is particularly evident in the expenditure patterns of lower-income household, and their response to financial shocks such as reduced income or new cost burdens; for example, public transit services tend to provide affordability because they provide a fallback option to lower-income commuters when their vehicles are unavailable. Although cost savings may benefit all income classes (even affluent travelers appreciate cheaper fuel for their limousines and discounts on first-class air fares), only savings for lower-income households can be considered to increase affordability. Travelling demand, accessibility versus mobility, land use development patterns, transportation cost and options determine affordability of transportation (Litman, 2017).

1.2 Statement of the Problem

According SIDA (2014) there 15 million or (17.6% of the total population) disability's in Ethiopia, which comprises 95% poor. In addition to impairment problems, they face social and economic exclusions resulting from transportation access. The problem related to transportation accessibility for disability's peoples is not only the issue of disabilities but it is also a societal

controversy. And its effect on peoples with disabilities' participation in socio-economic activities is critical, which should be addressed responsively in order to answer the disadvantaged part of the society. A report by Bahir Dar city administration labor and social affairs department (2019) showed that there are about 1218 people who are living with disabilities in Bahir Dar city (personal communication with Hailu, Bahir Dar city administration labor and social affairs department director on September 03, 2019). The report only indicates those people who reported to the office for some kind of services. However, the report from Bahir Dar city disability association shows that there are well above 10,000 people who live with some kind of disabilities (Personal communication with Yihayise, chairman of Bahir Dar city administration disabilities association on September 02, 2019).

The lack of appropriate services for people with disabilities is a significant barrier to transportation. According to World Bank (2002 cited in Demelash, 2007), Anbessa city bus enterprise gives service only to 27 % of the public transport users, which might have risen to 30-35 % currently, while more than one-third of the total population is pedestrian. The remaining 30% of the population use taxi provided by private sector this is because the society can't afford the transport means, and thus prefer to walk. As a result, the level of service use of public transport is very low.

In the automotive mobility solution report these barriers are found in buildings, the physical space around and between buildings and in the virtual environment. To correct these issues would include eliminating obstacles in the built environment, enabling access to public transportation, eliminating problems within public vehicles and making it easy to board and land, as well as making information and communication services appropriate for use by all. The key is

to integrate architectural, planning and transport measures throughout and across the entire mobility system (Automotive Mobility Solution, 2012).

Children with disabilities are less likely to attend school, thus experiencing limited opportunities for human capital formation and facing reduced employment opportunities and decreased productivity in adulthood (WHO, 2011). People with disabilities may possibly have extra costs resulting from disability such as costs associated with transportation care the wheelchair and assistive devices or persons. Barriers to accessibility in transport for people live with disabilities is lack of regulatory frameworks and inadequate monitoring and enforcement of access legislation, lack of resources and perception of high cost for implementation; knowledge gaps, barriers in physical infrastructure, vehicle design, information, social acceptance (Babinard, 2012) and “factors in a person’s environment that, through their absence or presence, limit functioning and create disability. These include aspects such as: a physical environment that is not accessible, lack of relevant assistive technology (assistive, adaptive, and rehabilitative devices), negative attitudes of people towards disability, services, systems and policies that are either nonexistent or that hinder the involvement of all people with a health condition in all areas of life.” (WHO, 2011 cited in center of disease control and prevention, 2019).

As stated above people with disability ace transportation accessibility problem in both developed and developing countries. Transport accessibility problems makes people with disability face marginalization in social, economic, health and others services and expose them to poverty (Steinfeld, 2011). On other hand, there are a range of researches related to transport accessibility to people with disability in Addis Ababa (Henoke, 2014) and evaluation of transport accessibility policy and practice (Rahel, 2017). However, there is a gap of research on assessment of factors affecting public transportation accessibility

to people with disability in Bahir Dar city administration. Therefore, this study focuses on assessing the magnitude of access to public transportation for people living with disability, and identify the factors that affect urban public transport accessibility in the city. The findings of the study should be taken considering the following scope: the study focused on public transportation accessibility dimensions such as physical infrastructure and vehicle design, mobility, user information and guidelines, regulator systems and network connectivity. The participants were those who have three types of disabilities such as visually impaired, physical handicapped and deaf.

2. LITERATURE REVIEW

2.1 Factors Affecting Public Transportation Accessibility

1. Public Transport Mobility

As stated by Litman (2019) mobility refers to physical movement, measured by trips, distance and speed, such as person miles or kilometers for personal travel, and ton-miles or ton-kilometers for freight travel. Heavy reliance on public transport mode increases the efficiency of urban people mobility. Moreover, easing the level of congestion and presence of an efficient public transport system creates a safe, sustainable and equitable urban mobility that in turn increases productivity of the residents (Meron, 2007). Persons with disabilities face widespread barriers in accessing services for examples health, education, employment, transport, and information; these include inadequate policies and standards, negative attitudes, lack of service provision, inadequate funding, lack of accessibility, inadequate information and communication, and lack of participation in decisions that directly affect their lives. There are more than one billion persons with disabilities in the world, of WHO between 110–190 million experience very significant difficulties. This corresponds to about 15 percent of the world's population. The prevalence of disability is growing due

to population ageing and the global increase in chronic health conditions. Patterns of disability in a particular country are influenced by trends in health conditions and trends in environmental and other factors such as road traffic crashes, natural disasters, conflict, diet, and substance abuse. While not a unique urban issue, disability has an important urban access element attached to it (WHO, 2018).

People with disability have limited mobility due to their nature, as a result of these; they need transport access to perform day today activities. On the other hand, increased mobility increases accessibility or people with disability to more destinations or various reasons, but if people with disability have no opportunities to access transport they will be excluded in education, health services, social life and economic aspects (Litman, 2019). Besides, availability of public transport such as door to door service increases people with disabilities quality of participation in different areas of life (Muhammad *et al.*, 2018). On the contrary, lack of mobility transport plays options limits people with disabilities movement to get goods, services, social and economic advancement opportunities. For example, many people especially people with disability continue to lack access to transport. For instance, in Africa, an estimated 450 million people more than 70% of the region's rural population are still unable to reach jobs, education and healthcare services due to inadequate transport mobility problem (World Bank, 2017).

Mobility of people with disability can be affected by number of factors such as lack of transportation means, inaccessibility of transportation mode and related issues. For example, a survey conducted by Consumers Association (1990) found that 4 out of 5 people with disability and problems with transport accessibility. Besides, two-third of the participants reported that they could not

move by using public transport because of difficulty with using public transport that is not suitable or their movement. Moreover, a study conducted in Great Britain (Grewal *et al.*, 2002) found that majority of people with disabilities movement was restricted due to fear of getting to and from bus stops or stations or on and off buses and trains. It is also stated that developed countries have made substantial progress in enhancing the mobility needs of the disabled people through adequate provision of transportation infrastructural facilities; most developing countries are far behind (Raj, 2007).

2. Public Transport Infrastructure and Vehicle Design

Transportation infrastructures that do not help access to people with disability include: stepped and high doors, one door way, instability during travels, overcrowding during boarding, lack of sheltered seat at terminals and so on. More specifically vehicles infrastructures that make transportation inaccessible to people with disability may include: high and stepped entrance, difficulty to get into and out of seats, seats not available forced to stand, lack of place to put packages, lack of devices to hear or see location information, etc., moreover long walks, poor fare collection facilities, poor crowd flow design, insufficient seating to wait, inaccessible transit stops, and insufficient sheltered seats are some of physical structures of public transport that create difficulty to people with disability transportation accessibility (Nyangueso, 2006).

Promoting transport infrastructure and services development is necessary to support economic growth and social equity. This development can be achieved in a way that is consistent with the human health and environmental needs (Hidalgo & Huizenga, 2013). On the other hand, people with disability face mobility problem by using public transport modes because of designs and facilities that do not consider needs of people with disability (BVG, 2003). For

example, some public transport modes lack ramps have higher or low steeps, lack of lifts, and lack of places for wheels etc. A study conducted in Nigeria showed that location of terminal and terminal facilities- shelter, seats, lights, toilet, time table and security suffers from prolongs serious neglect. Moreover, sidewalk ways, travel information and travel security are in deplorable state. In Nigeria, public transports do not have, wider and low floor steps, hand- rail for boarding and alighting, adequate travel information, lack conducive bus stops, conducive curbs and lack of ramps and, prioritized seats (Raj, 2007). A study conducted in Libya (Bengazi region) revealed that public transport systems such as buses and taxis pose major obstacles to be used by people with disabilities due high entry steps with high risers; lack of sufficient grab rails entrances and inside the vehicle ;narrow door openings ;narrow lanes (aisles) and seat spacing; and slippery or not leveled vehicle floors. Besides, infrastructures or public transport in Libya showed that bus station, parking lots, seating and waiting areas were other major problems in the country (Aljanzouri *et al.*, 2014). The same is true in Kenya in which people with disability aced inaccessibility of public transportation due to problems associated with the structural design and operation of public service vehicles and the roads and terminal facilities (Nyangueso, 2006).

3. Accessibility of Public Transport Network Connectivity

In most small cities, bus routes are radials converging on the CBD. In medium-size and large cities, the bus networks are larger and more complex and may not resemble any simple pattern. Most routes follow major streets, so the network resembles the street pattern (Black, 1995 cited in Mulu, 2015). Network connectivity with more roads or paths that connect one geographic area with another enhances additional direct travel or people with disability. This can include the density of sidewalk, road and public transit networks, and

the quality of connections between modes, such as bicycle parking at transit stations, and public transit connections to airports. Public transport network connectivity should be easily accessible to people with disability. It should be considered as a whole, rather than a series of discreet movements, and each individual element of the transport chain such as walking to a bus stop, waiting for a bus, getting on and off the bus, making a connection, getting on and off second vehicle and walking to destination needs to be user-friendly and accessible to people with disability (Wilson, 2003).

4. Public Transport User's Information and Guidelines

Since disabled peoples have lots of constraints related to their nature, aiding devices and guiding information with soft touch ICT assisted equipment is needed to enable transportation access easy. Consider a range of bottom-up and top down legislative and policy mechanisms including: consumer protection, non-discrimination legislation covering information and communication technologies and direct obligations on those developing ICT systems, products, and services (WHO, 2011). In the public and private sector adopt policies on procurement which take into consideration accessibility criteria. Support the development of telephone relay, sign language, and Braille services. When designing and distributing ICT equipment and services, developers should ensure that people with disabilities gain the same benefits as the wider population. Producers and providers should incorporate accessibility features in the products and services they design and sell. Support the education and training of persons with disabilities to take advantage of ICT including training to ensure digital literacy and skills (WHO, 2011). Information at stops and stations can be of three types – visual, audible and tactile. It is used to inform people of the vehicle routes that will use the stop or station, the timing of the vehicle, where to board the vehicle, the arrival of the vehicle and any changes to “normal” service. It can also be used to tell PLM which vehicles are

accessible, and how accessible stops and stations may be (Sustainable development department, 2013). A study made in Libya demonstrated that people with sensory impairments often had difficulties identifying the correct vehicle to board, the correct fare to pay, or the point at which to get off because of absence of tactile and other information to guide them to use public transport facilities (Aljanzouri *et al.*, 2014).

5. Public Transport Regulatory System Accessibility

People with disability should not be discriminated in public transport use. There should be legal duties on service public transport providers and authorities working in transport services not to discriminate people with disability in public transport uses. To this end, there should be enforceable standard regulations for accessibility of public transport vehicles (Williams, 2003).

The main goals of public transport regulation are to: ensure that services are operated in line with government policy, satisfy demand for public transport as much as possible, and maintain standards of quality and safety, control fares at affordable levels (sometimes). Regulation may also be considered necessary to prevent operators from abusing a monopoly position, or, in a competitive situation, to control undesirable or potentially dangerous aspects of competition between operators. Worldwide, initiatives to develop accessible public transportation systems focus primarily on improving accessibility to public transportation infrastructure and services, setting up “special transport services” for people with disabilities, developing campaigns and education programmers to improve policies, practices, and the use of services. The main goals of public transport regulation are to: ensure that services are operated in line with government policy, satisfy demand for public transport as much as possible, maintain standards of quality and safety, and control fares at affordable levels (sometimes). The extent of regulation varies considerably. At its most basic, it

covers the licensing of vehicles only, usually with certain provisions designed to promote safety (World Bank Group, 2006). Weak regulation may result in inadequate service capacity, if available resources are inefficiently utilized due to a regulatory regime that permits inefficient operating practices. It may result in the use of inappropriate or poor quality vehicles, or poor safety performance, if construction and use regulations are poorly framed, or poorly enforced. Inappropriate vehicle types, or inefficient operating practices, may in turn result in buses contributing unnecessarily to traffic congestion (World Bank Group, 2006).

2.2 Accessibility Difficulty of Public Transportation for People with Disability

Public transport for general society in general and for People with disability in particular can be easy or difficult to be accessed. Studies show that people with disability have easy transportation accessibility when there is adequate availability of transport options, affordability, user information availability, and physical infrastructure suitability, vehicle comfort for seat and movement, accessibility of easy connectivity (Nyangueso, 2006). Difficulty of public transportation for people with disability can arise from different factors. These difficulties can be personal and/ or environmental. Personal difficulties may include: mobility limitations due to physical limitations or problems related with type of disability, social interaction problems and economic and constraints and psychological problems. Environmental factors on the other hand may comprise of constraints in policy that do not support their transportation, location of public transportation for accessibility and attitude of the public towards transportation of people with disability (Nyangueso, 2006; Bascom, 2017). Difficulty of public transport accessibility can have effect on people's access to education, employment, social-economic activities,

recreation and other areas of life (Nyangueso, 2006). Steinfeld (2011) argues that due to public transport accessibility problems, people with disability could face marginalization in social, economic, health and others services and exposed to poverty. Problems in access and mobility in transportation for people with disability results in increasing poverty and can impede their participation in economic, social and political processes life (Babinard *et al.*, 2012). In connection with this, Short (2002) suggested there is a need to use transport policies and legislation that enforce the concerned bodies to make transportation inclusive and accessible to society in general and to people living with disability in particular. Babinard *et al.* (2012) also suggest that there is a need to use universal design to enable persons with disabilities to live independently and participate fully in all aspects of life).

2.3. Conceptual Framework for the Study

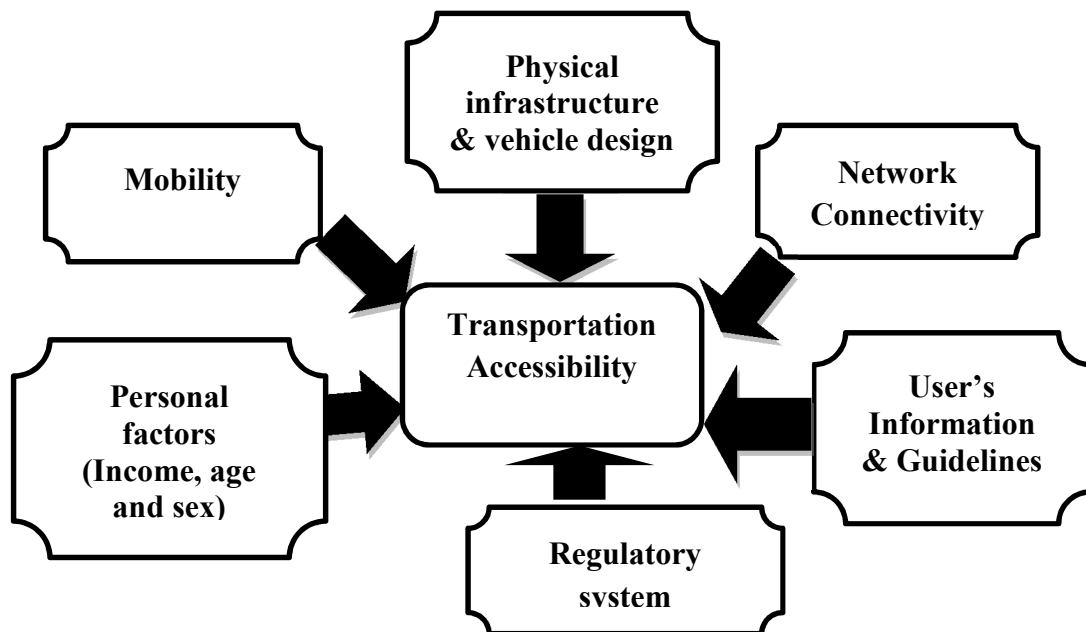


Figure 1: Conceptual framework of transportation accessibility
Source: Adapted from Litman (2017)

3. RESEARCH METHODOLOGY

3.1 Description of the Study Area

Bahir Dar is a city in north-western Ethiopia. It is the capital of the Amhara region. Administratively, Bahir Dar is one of a metropolitan city in the region, a designation in between a chartered city such as Addis area: 10.81 mi² elevation: 5,906' getting there, with a variety of attractions in the nearby Lake Tana and Blue Nile river. The city is known for its wide avenues lined with palm trees and a variety of colorful flowers. In 2002 it was awarded the UNESCO cities for peace prize for addressing the challenges of rapid urbanization (Bahir Dar city Guide 2016). Transport system in Bahir Dar which is run by a transport office. With a fleet of 16 buses, 2998 Bajaj, 993 mini bus, 119 Damase and 58 Lada taxi it operates on 171 routes and transports about 366,184 passengers per day. In addition to these, peak hour services are operated on 6 routes, out of the above 171 routes. On average a public City vehicles covers about 348,662 km per day. (Bahir Dar City administration transport office, 2020)

3.2 Research Design and Approach

Some literature classify research designs based on the purpose of the study as exploratory, descriptive and explanatory (causal). The purpose of this study is identifying the extent of public transportation accessibility, and identifying the factors that affect the accessibility of urban public transportation for people with disabilities. These objectives have both a descriptive and a causal nature. Thus, based on purpose, the study adopted both descriptive and causal research designs and a quantitative research approach for generating numerical data. Some other literature classifies research design based on time. This research uses survey research design specifically cross sectional survey research design in which data were collected in a snapshot using the survey method. Cross sectional survey research design refers to a procedure in quantitative research

in which researchers administer assessment to a sample or to the entire population of people to explain the attitudes, opinions, behaviors, or characteristics of the sample or population. Additionally, cross-sectional survey refers to a strategy of data collection at one time from larger number of participants (Creswell, 2012). Thus the researcher found it appropriate to use survey research design particularly cross-sectional design or this research since this research describes the result on the analysis that were collected at once from the study participants.

3.3. Target Population and Sampling

In this study, the population elements are the people living with disabilities in Bahir Dar city administration, especially visually impaired, People with Physical Disability and deaf. The total number of people living with disabilities in these natures of disabilities units is 385 (a report by Bahir Dar City Administration Labor and Social Affairs Department, 2019). These include: 38 visually impaired people, 134 people with physical disability, and 24 visually impaired people.

The researcher used stratified random sampling method from probability sampling technique to select respondents from the target population. Thus, the stratification was made based on type of disability; that is, participants with: visual impairment, hearing impairment and physical disability. Since each stratum is more homogeneous than the total population, stratified random sampling enable to get more precise estimates for each stratum and by estimating more The sample size is 196 respondents out of the 385 population available under the mentioned nature of disabilities units. The sample size was calculated using a formula called Slovin's formula (Israel, 2013).

$$n = \frac{N}{1 + n(e)^2}$$

Where n = number of samples (sample size), N = total population (population size),

e = error tolerance - at desired level of confidence, take 0.05 at 95% confidence level

$$n = \frac{385}{1 + 385(0.05)^2} = 196$$

Table1: Target Population and Sample Size

No	Strata by nature of disabilities	Population	Sample size
1	Visually impaired	75	38
2	People with physical disability	263	134
3	Deaf	47	24
Total		385	196

3.4. Data Collection Instrument and Reliability

Questionnaire is used for data collection in this investigation. The questionnaire has three parts. The first part contained items that helped to collect demographic information about respondents like sub-city, gender, education level, and type of disability and so on. The second is related with using Likert scale to collect data. The questionnaire was adapted from previous researches such as Henok (2014), Tessema (2017) and Bascom (2017). Besides, some of the questionnaires were developed based on careful review of literatures. The instrument is a five-point liker scale which was used to rate items in the questionnaire. The scale ranges from strongly disagree to strongly agree with points that range from 1 to 5 for positive statements and vice -versa for negative statements. The third instrument is concerned with measuring degree of public transportation for people living with disability. The instrument was used 8

itemized statements with a five point Likert scale from "extremely difficult" (with a score of 1) to "extremely easy" (with a score of 5). The instrument was adapted from Litman (2019).

Reliability and validity of instruments was checked using a pilot test which was done on data collection tools using small sample of respondents before a full scale study to identify the quality of data collecting instruments /tools. Pilot test was conducted by selecting 12 respondents from the target population (4 respondents from each population stratum).The instruments validity was checked based on respondents' comments and suggestions. Thus, the instruments were made to be unambiguous, simple, well defined, clearly understood and presented in a consistent way. Moreover, the instruments reliability was checked by using Cranach's alpha reliability coefficient. Thus, the second Likert scale instrument with its subsections (that is, mobility accesses, vehicle design and physical infrastructure, network connectivity, user information and guidelines and regulatory systems) had alpha (α) reliability coefficient of 0.81. Whereas the third Likert scale questionnaire, that is, degree of transport accessibility for people living with disability had alpha (α) reliability coefficient of 0.84. The reliability coefficients showed that the instrument had adequate reliability to conduct the main study.

3.5. Data Analysis Method

The data for this research were analyzed using a combination of descriptive and inferential statistics. Mean, standard deviation, frequency and percentages were used from the package of descriptive statistics so as to describe the magnitude of the independent and dependent variables. To ease interpretation, a scoring guideline suggested by Roche et al. (2018) was used as a rule of thumb. According to them, scores falling between 1 and 2.49 are described as "poor",

between 2.5 and 3.49 are described as “fair” (‘neither good nor poor accessibility’), and scores between 3.5 and 5.0 are described as "good ". Besides, based on the above rule thumb, difficult, moderately difficult and easy are used to determine degree of difficulty. Thus, scores falling between 1 and 2.49 are measured as "difficult ", between 2.5 and 3.49 are described as “moderately difficult” and scores between 3.5 and 5.0 are considered as "easy". Inferential statistics, particularly the ordered probit regression model, was estimated to identify the factors that affect accessibility of transportation for people living with disabilities. Ordinal regression is appropriate when the dependent variable, in this case degree of accessibility of transportation, is measured following ordinal scale.

4. RESULTS AND DISCUSSION

4.1 Response Rate and Distribution of Respondents by Sub-city

A total of 196 questionnaires were distributed to people living with disabilities. Out of the 196 questionnaires, 183 were returned with a response rate of 93.4%. The residence of the respondents in relation to selected sub cities of the Bahir Dar city administration is presented in Table 2.

Table 2: Residence of the Respondents by Sub -City

Sub-city	Frequency	Percent
Belay Zeleke	31	16.9
Tana	42	23.0
Dagmawi Tewodros	37	20.2
Fasilo	22	12.0
Shume Abo	25	13.7
Dagmawi Menelik (Menelik II)	26	14.2
Total	183	100.0

Source: Author’s survey (2020)

4.2 Job Status of the Respondents

The job status of the respondents was analyzed to find out the percentage of the respondents employed and not employed, retired and other means of income sources. The responses were analyzed, and the results are depicted in table 3.

Table 3: Numbers of Respondents by Job Type

Employment status	Frequency	Percent
Employed	66	36.1
Unemployed	53	29.0
Retired	1	0.5
Student	33	18.0
Unpaid family worker	4	2.2
Others	26	14.2
Total	183	100.0

Source: Author's survey result (2020)

As illustrated in table 3, the highest percentage of respondents were employed (36.1%) followed by unemployed (29.0%) and students (18.0%), respectively. Retired respondents constitute the least proportion (0.5%) followed by unpaid family workers (2.2%). The rest of the respondents' (14.2%) employment status was not specified.

4.3 Income Level (Birr per month) of Respondents

The study sought to know the various income levels that the respondents earn per month. The responses were analyzed, and the results are shown in table 4. As depicted in Table 4, more than half of the respondents (46.4%) earn less than 500 Ethiopian birr per month. Next to this, (20.8%) earn 500-1000 Ethiopian birr per month. Next to this, 12.6% of the respondents earn greater than 5000 Ethiopian birr per month followed by 10.9% of the respondent who

earn 2001-3000 Ethiopian birr. Besides, the respondents who earn 3001-5000 Ethiopian birr constitute only 6%. The rest of the respondents earn 1001-2000(3.3%), respectively.

Table 4: Numbers of Respondents by Income per Month

Income per month	Frequency	Percent
< 500 birr	85	46.4
500 – 1000 birr	38	20.8
1001 – 2000 birr	6	3.3
2001 – 3000 birr	20	10.9
3001–5000 birr	11	6.0
>5001 birr	23	12.6
Total	183	100.0

Source: Author’s survey result (2020)

4.4 Frequently used Mode of Transport by the Respondents

The study sought to identify frequently used mode of transport by the respondents. To this end, different mode of transportation systems was given or options to be selected. The responses were analyzed, and the results are shown in table 5. As shown in Table 5, more than half of respondents frequently use minibus (52.5%) followed by Bajaj (27.9%), city bus (13.7%) and own car (2.2%). Respectively equal percentages of respondents (1.6%) frequently uses travel on foot and use other means, respectively. The rest of the respondents had airport taxi (0.5%).

Table 5: Number of Respondents by Most Frequently Used Mode of Transport

Mode of transport	Frequency	Percent	Rank
Minibus	96	52.5	1
Bajaj	51	27.9	2
City bus	25	13.7	3
Own car	4	2.2	4
Travel on foot frequently	3	1.6	5
Other	3	1.6	6
Airport taxi	1	0.5	7
Total	183	100	

Source: Author's survey result (2020)

4.5 Magnitude of the Dimensions of Public Transportation Accessibility

4.5.1 Public Transport Mobility for People Living with Disabilities

The first objective was made to identify extent of accessibility of public transport for mobility of people with disabilities. To this end, the respondents were asked to indicate the state of accessibility of public transport for mobility of people with disabilities in Bahir Dar city administration. The responses were analyzed, and the results are revealed in table 6. As indicated in Table 6, an overall mean and standard deviation of ($M=2.05$, $SD= 0.86$) which indicated that the respondents had low level of accessibility of public transport for mobility. Among the items indicated in the table, respondents had neither sufficient nor insufficient waiting areas space for wheelchair users to wait public transportation system. On the other hand, the respondents had low level of accessibility of public transport in terms of item 2 (use of wheelchair accessible vehicles, $M=1.13$, $SD=1.13$), item 3 (location of bus stops within a walking distance from their home, $M=1.79$, $SD=0.87$) and item 4 (there is

difficulty of walking up and down of stairs in waiting area, $M=1.83$, $SD=0.954$), respectively.

Table 6: Public Transport Mobility for People Living with Disabilities

No	Item for Transportation Mobility	Mean	Std. Dev.
1.	Waiting areas have sufficient space for wheelchair users	3.44	1.146
2.	There are wheelchair accessible vehicles (WAV) that enable users to stay in a wheelchair while the vehicle is driven	1.13	0.474
3.	Bus stops are located within a walking distance from home	1.79	0.873
4.	It is easy walking up and down of stairs in waiting area	1.83	0.954
Overall mean		2.05	0.86

Source: Author's survey result (2019)

The overall mean that is 2.05 indicates that there is low level of accessibility of public transport because of unsuitability of lack of accessibility to wheel chair users, being far from their residence and location of bus stops was difficult to travel easily. This is quite different from other study conducted in Great Britain (Grewal, 2002, as cited in Tessema, 2017). The study found that majority of people with disabilities movement was restricted due to fear of getting to and from bus stops or stations or on and off buses and trains. In fact one thing makes the two studies similar, that is restriction of movement of people with disability by using public transportation means.

The current study findings supports study conducted in Latin America in which people with disability suffer from low mobility access because of public transport accessibility limitations. Because of the limitations in mobility, people with disability encountered marginalization and poverty that is hard to break. Mobility of people with disability in these regions was occurred due to high fares; informal or deficient mass transit (in terms of availability and quality of service); and limited access to vehicles (Steinfeld, 2011). This implies that people with disability in Bahir Dar city administration are excluded from general society because of lack of mobility problems by using public transportation systems. In line with this, United Nations Educational, Scientific and Cultural Organization (UNESCO) (UNESCO, 1995 cited in Rahel, 2017) argues that failure to provide an accessible means of transport discriminates and isolates people with disability from leading independent life, leaving them segregated or excluded from education, employment and social and political life.

The above discussion suggests that the poor public transport mobility access to people with disability should be improved to solve marginalization in social, economic, health and others services and alleviate their poverty (Steinfeld, 2011). This suggests a need to work hard to make public transport accessible to people with disability movement in the city administration.

4.5.2 Public Transport Infrastructure and Vehicle Design

The researcher sought to determine the state of quality of public transport service for people with disabilities. The study findings are as shown in table 7.

Table 7: Respondents Mean Score for Public Transport Infrastructure and Vehicle Design

Item for Public Transport Infrastructure and Vehicle Design	Mean	Std. Dev.
There are step-free access of low-floor public transport options in the city	2.00	0.961
Bus stops are adapted so that the access ramp can be easily deployed and used by wheelchair users	1.46	0.677
There is free or reduced fare policy regarding public transport use for people with disability	2.32	1.227
There are priority seating areas in the public transport vehicles for people with disability	1.70	0.812
Public transport vehicles have minimum obstacle free footway systems that are suitable for people with disability	2.78	1.262
Public transport vehicles have tactile surfaces to warn people with visual impairment from hazards	2.72	1.268
Public transport vehicles have operable parts of ticket machines that are reachable by wheelchair users	2.92	1.277
Public transport vehicles have ramp access for users	1.45	0.716
People with disability get door-to-door accessible minibus services	1.58	0.973
Overall mean	2.10	1.02

Source: Author's survey result (2020)

As shown in Table 7, an overall mean 2.10 was recorded indicating that there was low accessibility of public transport infrastructure and vehicle design quality for people with disability movement in the city. Moreover, the mean score for each item (below medium score) showed that the respondents come across difficulty in transportation due to infrastructure and vehicle design problems such as lack of step-free access, low-floor transport options; lack of

adapted accessible ramp for wheelchair users; lack of free or reduced fare policy regarding public transport use; lack of availability of priority seating areas in the vehicles; lack of existence of obstacle free footway systems; lack of existence of public transport vehicles in having tactile surfaces; lack of existence of the vehicles that have operable parts of ticket machines; lack of ramps accesses in public transport vehicles; and lack of presence of door-to-door accessible minibus services. The current research result indicated that there was poor quality public transport accessibility to people with disability in Bahir Dar city administration.

This study supports different research results published in 344 articles which were studied different countries of the world. For example, the poor quality arises from two dimensions: physical and information barriers. The physical barriers included: poor plan and protection of pedestrian amenities, bus stops that may include narrow pavements, high curbs, uneven or slippery surfaces, lack of benches, stairs without handrails, vehicles without ramps, ramps with low usability, etc. Informational obstacle gross lack of facilities in relation to verbal, written, and visual information that help people with disability get public transport services easily and conveniently (Stjernborg, 2019). Moreover a study conducted in Addis Ababa indicated that public transport has a number of problems related to physical structure and vehicle design that include: lack of specialized space, slippery floor, high entry steps, disunity to get in to bus station, lack of information on destination of the transportation, lack of ramps for wheelchair users, difficulty of getting on/off bus and related problems (Henok, 2014). The current study is also consistent with other studies in conducted in Nigeria (Raj, 2007), Libya (Aljanzouri *et al.*, 2014) and Kenya (Nyangueso, 2006). For instance in Libya, public transport systems such as buses and taxis pose major obstacles to be used by people with disabilities due

high entry steps with high risers; lack of sufficient grab rails entrances and inside the vehicle; narrow door openings; narrow lanes (aisles) and seat spacing. Besides, bus stations, parking lots, seating and waiting areas were other major problems in the country (Aljanzouri *et al.*, 2014).

The above discussion implies that people with disability in Bahir Dar city administration are isolated from using public transportation means mainly due to poor infrastructure and vehicle design. This hampers them from participation in education, health services, economic aspects, and other important life aspects. In line with this, Hidalgo and Huizenga (2013) stated that poor transport infrastructure and services development hinders people with disabilities active participation in economic growth and social equity, health services and so on. This also suggests that there is a need to improve public transport systems infrastructure and vehicle designs to make people with disability actively participate like other sections of society in different areas of life.

4.5.3 Public Transport Network Connectivity

This study also sought to reveal the state of public transport network connectivity accessibility for people with disabilities in Bahir Dar city administration. As shown Table 8, overall mean score ($M=2.97$, $SD=1.167$) illustrated that public transport network connectivity accessibility for people with disabilities in the city was neither low nor high. In the items the mean score is between 2.5 and 3.5 which show that public transport network connectivity accessibility for people with disabilities was neutral which means neither poor nor good for people with disabilities public transport service use.

Table 8: Public Transport Network Connectivity for People with Disabilities

Item for Network Connectivity	Mean	Std. Dev.
Public transports have network connectivity (more roads for paths that connect one geographic area with another) to allow more direct travel for people with disability.	3.22	1.253
Bahir Dar city has sufficient public transportation infrastructure connectivity that is good for mobility of people with disability	3.31	1.215
There is little public transport universal access features for people with disability in Bahir Dar city administration	2.79	1.120
Public transport vehicles have unobstructed moving paths that are suitable for people with disability.	2.58	1.080
Overall mean	2.97	1.17

Source: Author's survey result (2020)

The current study result revealed that public transport network connectivity accessibility for people with disability is neither poor nor good. This implies people with disability did not access it easily. This also suggests that there is a need for improving it to make it accessible to these people. With regard to this notion, Cullen (2006) as sorts that public transport chain has to be efficiently linked for example, home to starting bus stop, bus stop to vehicle, ride in vehicle, vehicle to destination bus stop, and bus stop to entrance of destination building should be available and conducive. If any particular link in the chain is inaccessible, the transportation service accessibility would be disconnected that make it impossible for transportation. This implies that Bahir Dar city administration public transport network connectivity accessibility should be reformed to be conducive for people with disability transportation. In

connection with this concept Litman (2019) argues that network connectivity with more roads for paths that connect one geographic area should be promoted to enhance additional direct travel for people with disability.

4.5.4 Public Transport User Information and Guidelines

This sub-section mainly focuses on assessing user's information and guidelines accessibility of public transport for people with disabilities. As shown in Table 9, an overall mean and standard deviation of (M=1.69, SD= 0.834) was recorded indicating that there was low user's information and guidelines accessibility of public transport for people with disabilities. The mean score indicated that in all the items case the mean score is between 1.0 and 2.49. This shows that there was poor user's information and guidelines accessibility of public transport for people with disabilities with regard to having: real-time information displays; static visual information; real-time and pre-recorded audible information; tactile information for people with visual impairment; and audible information announcing systems regarding the current, next or forthcoming stops to benefit particularly people with hearing impairment.

According to the result of the current research, there was poor user's information and guidelines accessibility of public transport for people with disabilities in Bahir Dar city administration. The result of this study contradicts the study conducted in many Latin American countries such as Brazil, Peru and Colombia (Sustainable Development Department, 2013). In these countries there are some formal form of legislation and guidance concerning access to transport. There are also informal guidelines promulgated by NGOs and government agencies to initiate the issue for more formal legislation and regulations which govern public transport uses and specification. On the other hand, the current study supports a study conducted by (Sustainable Development Department, 2013).

Table 9: Mean Score for User’s Information and Guidelines of Public Transport

Items for user’s Information and Guideline	Mean	Std. Dev.
Public transport vehicles have real-time information displays	1.70	0.860
Public transport vehicles have static visual information that are large enough for people with hearing impairment to read/see.	1.67	0.801
Public transport vehicles have real-time and pre-recorded audible information that are useful for sight-impaired people.	1.64	0.799
Public transport vehicles have tactile information that help people with visual impairment to access information about transport services, and facilities in the station.	1.63	0.736
Public transport vehicles have audible information announcing systems regarding the current, next or forthcoming stops to benefit particularly people with disability	1.81	0.973
Overall mean	1.69	0.83

Source: Author’s survey result (2020)

In Taiwan, the result showed that people with special needs found that the bus stop signs were too high and too small. They had difficulty identifying types of buses, bus routes and existence of assistive devices. This study is also consistent with a study done in Libya which demonstrated that people with sensory impairments often had difficulties identifying the correct vehicle to board, the correct fare to pay, the point at which to get off because of absence

of tactile and other information to guide them (Aljanzouri *et al.*, 2014). The current study result suggests that the Bahir Dar city administration should develop and implement necessary user's information and guidelines for public transport users including people with disabilities. The study one can infer that people with disability in Bahir Dar city administration face difficulty in using public transport systems specifically because of lack of user's information and guidelines accessibility. In this Sustainable Development Department (2013), recommends using these strategies to inform people about vehicle routes that will use the stop or station, the timing of the vehicle, where to board the vehicle, the arrival of the vehicle and any changes to "normal" service.

4.5.5 Public Transport Regulatory System

This sub-section mainly focuses on assessing user's information and guidelines accessibility of public transport for people with disabilities. As shown in table 10, the overall mean score indicated that accessibility of public transport regulatory system for people with disabilities was weak ($M=2.10$, $SD=1.0622$).with regard to each item analysis result, participants were not sure whether or not there was a system of revising the public transport policy and strategy by considering people with disabilities benefit ($M=2.50$, $SD=1.378$). Moreover, concerning to other issues, the mean score was between $m=1$ and $m= 2.49$ which shows that the respondents there was low accessibility of public transport regulatory system for people with disabilities. This means system that help to participate people with disability was low in relation to: building the capacity of the public transport institutions; assuring legally enforcing system to use public transport; active participation on public transportation policy formulation; and setting priorities on the transportation use.

Table 10: Mean Score by Public Transport Regulatory System for People with Disabilities

Item for Regulatory System	Mean	Std. Dev.
There is a system of revising the public transport policy and strategy by considering people with disabilities benefit	2.50	1.378
There is a system that help to build the capacity of the public transport institutions	2.40	1.223
There is a system to assure legally enforcing system to use public transport to be practical for application of people with disability	2.26	1.123
There is a practice of participating people with disabilities on public transportation policy formulation	1.48	0.747
There is a practice of setting priorities for follow-up to assure participation of people with disabilities public transportation use	1.77	0.840
Overall mean	2.1	1.06

Source: Author's survey result (2020)

The result showed that there is poor public transport regulatory system accessibility or people with disability. This result contradicts a study result conducted in India (Indian government, 1995 and rehabilitation council India, 2004, cited in Sustainable Development Department, 2013). Thus, in India, the rehabilitation council of India developed a training aid to guide the development of barrier free environments for people with disabilities public transportation system. As a result people with disability benefits from public transport regulatory system practice based on rules and regulations. On the contrary, the current study supports a study conducted in Nigeria. The result

indicated that there was poor regulatory public transport system to help people with disability transportation (Odufuwa, 2007). Because of this people with disabilities were suffering from public transport usage and accessibility. This happened as a result of policy makers and concerned bodies negligence or lack of awareness about rights to travel and access basic facilities of people with disabilities. The same is true in Mexico in which the country enacted disability rights laws in 1995 with regard to public transport accessibility for people with disability but does not have comprehensive national statutes to enforce them (IDRM, 2003). Moreover a study done in Addis Ababa showed that the policy, regulation and directives have serious problem for the people with disability due to poor implementation of policy and regulation (Rahel, 2017). On the other hand, this study result contradicts other studies. For example, available literature review indicates that governments in Europe and other developed countries have regulation systems that enforce transportation systems that are quicker, safer, more punctual and environmentally friendly transport systems.

In fact, simply enacting regulations and laws without making them accessible to the public transport user is not important. Thus there is a need or training, making advocacy and promotion activities (Sustainable Development Department, 2013). This exposes public transportation systems to functioning efficiently. In connection with this World Bank group (2006) argues that weak regulation may result in inadequate service capacity, if available resources are inefficiently utilized due to a regulatory regime that permits inefficient operating practices. It may also result in the use of inappropriate or poor quality vehicles, or poor safety performance. Inappropriate vehicle types, or inefficient operating practices, may in turn result in vehicles contributing unnecessarily to traffic congestion. The above discussion implies that there is a need to make public transport regulatory system to be accessible for people with disability

transportation. This helps to solve people with disabilities problem of public transportation use and inefficient use of public transport that lead to traffic congestion.

4.5.6 Level of Transport Accessibility for People Living with Disabilities

The study gauged the level of accessibility to transport services for people living with disabilities using an ordinal level measurement. As indicated in Table 11, the result of the analysis showed that the overall accessibility of transport services to people living with disabilities ranges between very difficult to moderately difficult with a mean score of 2.4 and $SD=0.9$. The respondents particularly rated convenience of transportation facilities (e.g. presence of ramp for wheel chairs) to be the worst to them with a mean score of 1. Moreover, they rated the following issues as difficult: transportation comfort, safety, presence of convenient facilities, and availability seating. This indicted that the people with disability in Bahir Dar City Administration was difficult to people with disability in terms of transportation facilities convenience, transportation comfort and safety, presence of convenient facilities, and availability seating. This suggests that there is a need to intervene in the public transportation sector to for people with disability in the areas mentioned above issues. Besides, road network connectivity and vehicle speed for accessibility were rated as moderately difficult. This indicates that road network connectivity and vehicle speed for people with disability in the city were neither difficult nor easy. This also suggests that people with disability could easily participate in different areas of life activities and could not be productive in their everyday life. Therefore, there is a need to make the road network connectivity and vehicle speed easy for them to be productive in their everyday life activities.

On the other hand, other dimensions of transport accessibility such as easiness of walking on the street, and affordability of the services were rated better, falling within the easy rating. This implies that easiness of walking on the street and affordability was convenient for people with disability to use public transportation in the city. Of course, in reality this could not be a fact that was happening on the ground for the people with disabilities accessibility to public transportation. Thus, this needs further research to generalize whether or not walking on the street and transportation affordability was easy to access the public transportation system to people with disability. Generally, over all of the analysis result showed that accessibility of transport services to people living with disabilities was difficult ($M=2.4$, $SD= 0.9$). This indicates that public transportation accessibility for people with disability in Bahir Dar City Administration had negative effect on these peoples every day activities that leads them in turn increased poverty.

In connection with above discussion professionals in the areas argue that when people with disability face difficulty in accessing transportation services such as public transport services, they could have limited participation in education, employment, social-economic activities, recreation and other areas of life(Nyangueso,2006).Seinfeld(2011) and Babinard *et al.*, (2012) also states that due to public transport accessibility problems, people with disability could face marginalization in social, economic, health and others services and they could be exposed to poverty. In line with this, Short (2002)suggested that there is a need to use transport policies and legislation that enforce the concerned bodies to make transportation inclusive and accessible to society in general and to people living with disability in particular. Babinard *et al.* (2012) also suggest that there is a need to use universal design to enable persons with disabilities to live independently and participate fully in all aspects of life.

Table 11: Degree of Public Transport accessibility for people living with disabilities

Items measuring accessibility	Mean	Std. Dev.
The degree of transportation access as related to comfort of transportation facilities	1.49	0.79
The degree of transportation access related to safety of transportation facilities	1.39	0.86
The degree of transportation access related to convenience of transportation facilities (e.g. presence of ramp for wheel chairs)	1.04	0.30
The degree of transportation access related to speed of transportation facilities	3.42	1.22
The degree of transportation access related to affordability of the cost of transportation relative to the incomes of the disables	3.63	0.90
The degree of transportation access related to availability of priority seating area in the public transport facilities	1.43	1.050
The degree of transportation access to easily reach to different service areas in the city as related to the degree of transportation network connectivity	3.28	1.14
The level of easiness/difficulty of walking on streets	3.57	0.94
Overall mean	2.40	0.9

Source: Author's survey result (2020)

4.6 Determinants of Public Transport Accessibility for People Living with Disabilities

The study was aimed at identifying the factors that determine accessibility of people living with disabilities to transport services by identifying eight independent variables as presented in the conceptual framework in chapter two

and dependent variable (transport accessibility) which is described in section 12.

Table 12: Determinants of Transport Accessibility for People Living with Disabilities

Independent variables	Coif.	Std. Err.	Z	P> z	[95% conf. Interval]	
Physical infrastructure and Vehicle design	0.14	0.18	0.80	0.42	0.2063633	0.4931447
Network connectivity	0.34	0.13	2.64***	0.01	0.0868935	0.585543
Users information and guidelines	-0.13	0.14	-0.90	0.37	-	0.1521089
Regulatory system	-	0.10	-0.03	0.98	0.2067682	0.200746
Mobility	-0.05	0.12	-0.44	0.66	0.2964339	0.1870594
Income per month	.009	0.04	2.07**	0.04	0.0046604	0.1700711
Sex	0.16	0.33	0.49	0.62	-	0.8123601
Age	-0.008	0.11	-0.79	0.43	0.2961174	0.1255213
LR Chi2 (8) = 17.43, Prob> Chi2 = 0.0259, Pseudo R2 = 0.0212, Log Likelihood = -402.37						

Note: the dependent variable is public transportation accessibility measured at ordinal level; ***Significant at $p < 0.01$; ** significant at $p < 0.05$

Source: Author's survey result (2020)

As indicated in Table 12 the findings revealed that except network connectivity and income levels of people living with disabilities, all the remaining six variables turned out to be insignificant. As incomes of people living with disabilities improve, their accessibility found to improve significantly, which is

also intuitively sound. Likewise, as the network connectivity improves, accessibility of people living with disabilities improve which calls upon a focus on improving access through a more networked transport system. All other independent variables were found to have no significant impact in determining the accessibility of people with disabilities to transport services in Bahir Dar city.

As presented in Table 12, income level per month and network connectivity has significant impact on people with disability accessibility of urban transport. For example, Nyangueso (2006) says that those people with better income level have easier transportation options than with low income level. Litman (2019) also argues that affordability directly affects transport accessibility especially people with low income level. This also affects people with disability choice to use transportation which directly or indirectly affects their participation in economy, social, education and other areas of life. However, other variables like physical infrastructure and vehicle design, user's information and guidelines, regulatory system, sex and age contradicts other available research findings, for example, urban transport mobility limitation negative impact on people with disabilities accessibility to transportation for different purpose in their life (Nyangueso, 2006). Moreover, Litman(2019) stated that transportation physical infrastructure and vehicle design, user's information and guidelines, regulatory system have impact on transportation accessibility which help people(including people with disability to reach/ get desired services and perform their desired activities.

From the above discussion, one can infer that lack of most independent variables significant impact in determining the accessibility of people with disabilities to transport services in Bahir Dar city administration needs further

research to shed light on contradictory findings with other research results. It also calls for further research to generalize these variables impact on people with disability public transport accessibility and take necessary intervention on the issue under discussion.

5. CONCLUSIONS AND RECOMMENDATIONS

The study drawn the following conclusions based on the result of addressing each research objective. Thus, the public transport accessibility to people living with disability in Bahir Dar city administration was poor in terms of mobility movement accessibility; infrastructure and vehicle design accessibility; network connectivity accessibility; users' information and guideline accessibility; and regulatory systems accessibility for people living with disabilities. Moreover, the public transportation accessibility was reported as difficult for people living with disability in Bahir Dar City Administration. These results suggest that public transport accessibility for people with disability in the city has created problem to people with disability not to participate in different services and activities such as in educational, social, economic, health and other services and activities. In line with this, (Steinfeld, 2011) argues that due to public transport accessibility problems, people with disability could face marginalization in social, economic, health and others services and exposed to poverty. Problems in access and mobility in transportation for people with disability results in increasing poverty and can impede their participation in economic, social and political processes life (Babinard *et al.*, 2012). In connection with this, Short (2002) suggests there is a need to use transport policies and legislation that enforce the concerned bodies to make transportation inclusive and accessible to society in general and to people living with disability in particular. Babinard *et al.* (2012). Also suggest

that there is a need to use universal design to enable persons with disabilities to live independently and participate fully in all aspects of life).

Therefore, one can infer from this study that there is a need for intervention to make public transport systems accessible to people living with disability in Bahir Dar city administration to make these people participate actively in social, economic, health, and other areas life and make them lead productive life. Based on the results of the research, the researcher recommends that Bahir Dar City Administration should:

- Make public transport accessible for people with disability movement by creating sufficient space for wheelchair users to wait, using wheelchair accessible vehicles, locating bus stops within a walking distance from their home; and creating easily accessible walking up and down of stairs in waiting area and using other related facilities.
- Improve infrastructure and vehicle design by creating free access to low-floor public transport options; using priority seating areas and minimum obstacle free footway systems; using tactile surfaces, ramps, visual and audio information display systems, operable ticket machines and door-to door transport services and related facilities Improve
- Improve user information and guidelines so that people with disability get necessary information in alternative means to get suitable transportation services
- Improve regulatory systems accessibility so that people with disability exercise equal right to transport accessibility and get benefit from transportation services.
- Strive to improve the transport network connectivity of the city so that access to transportation by people living with disabilities will significantly improve. This can be done by creating more continuous

and unobstructed roads, paths, pedestrian roads and other means, and applying universal public transport access features and principles.

- Work on income improving schemes of people living with disabilities as it was confirmed in this study that it has significantly impacted the accessibility of people living with disabilities to transport services.
- Create conducive situations for further research in the area of discussion to generalize findings and construct public transportation services that make people with disability easily participate in education, health, employment, social- activities, recreation and other activities and participate in development effort of the country (Ethiopia).

LIMITATION

The findings of this study should be accepted taking into account the following limitations: (1) the independent variables are measured using ordinal scale measurement by developing itemized responses; and (2) the pseudo R^2 value explained small proportion of the variabilities in the dependent variable suggesting exclusion of variables that may be important in explaining access to public transportation by people living with disabilities.

REFERENCES

- Aljanzouri A., R. Anwar, & Y. Zaika (2014). Enhanced accessibility to transport infrastructure for people with disabilities living in urban areas in Benghazi Libya. *Journal of Mechanical and Civil Engineering*, 11(1): 01-06.
- Ana VULEVIC. (2016). Accessibility Concepts and Indicators in Transportation Strategic Planning Issues: Theoretical Framework and Literature Review. Institute of Transportation CIP, Department of Architecture and Urban Planning, Belgrade, Serbia.
- Automotive Mobility Solution. (2012). Biggest Mobility Barriers for People with Disabilities. Available at: <https://www.cdc.gov/ncbddd/disabilityandhealth/disability-barriers.html> Accessed on September 22, 2019.
- Babinard J. (2012). World Bank Inaugural Disabilities and Development Core Course Washington, D.C.
- Babinard J., W. Wang, C.H. Bennett & S. Mehndiratta (2012). Accessibility of urban Transport for people with disabilities and limited mobility: Lessons from East Asia and the Pacific. Safe, clean and affordable transport.
- Bahir Dar City Administration Labor and Social Affairs (2019). 2018 Budget Year report. Bahir Dar, Ethiopia.
- Bahir Dar City Administration Transport Office (2020). Bahir Dar City Administration Transport Office 2012 budget year report, Bahir Dar, Ethiopia.
- Bahir Dar City Guide (2016). Top Attractions. Available at: <http://bdrguide.et/> Accessed October 02, 2019.
- Bascom W. (2017). Transportation Related Challenges for Persons with Disabilities. A thesis Submitted to the degree of master of landscape Architecture Utah state university Logan, Utah.
- BVG (2003). the Accessibility of Urban Transport to People with Reduced Mobility DG Energy and Transport, European Commission. Available at: https://www.eukn.eu/fileadmin/lib/files/eukn/2010_accessible-transport.pdf
- Center of Disease Control and Prevention (2019). Disability and Health. Available at:

<https://www.cdc.gov/ncbddd/disabilityandhealth/disability-barriers.html>

Accessed On September 20, 2019.

Creswell J.W. (2012). *Educational Research: Planning, Conducting, and Evaluating Quantitative and Qualitative Research* (4th ed.). Boston, Ma: Pearson.

Cullen M. (2006). *Improving Transport Accessibility for All; Guide to Good Practice*, OECD Publications: Paris.

David J. Closs, D.J. & Y. A. Bolumole (2015). Transportation's Role in Economic Development and Regional Supply Chain Hubs. *Transportation Journal*, 54(1): 33-54.

Demelash A.A. (2007). *Analyzing public transport performance using efficiency Measures and spatial analysis: The Case of Addis Ababa, Ethiopia*. A Thesis Submitted to International institute for Geo-information Science and Earth Observation, the Netherland. Available at:

https://webapps.itc.utwente.nl/librarywww/papers_2007/msc/upla/abreha.pdf

DETR (1998). *A New Deal for Transport: Better for Everyone*. Available at: https://www.open.edu/openlearn/ocw/pluginfile.php/630978/mod_resource/content/1/new_deal_for_transport.pdf

Digital Globe (2018). Bahir Dar City Administration Google earth Map. Available at:

<https://www.google.com/search?q=bahir+dar+city+map&hl=en>

DPTAC (2002). *Attitudes of Disabled People to Public Transport: research study conducted for Disabled Persons Transport Advisory Committee*. London: DPTAC.

Eleni N. (2016). *Socio-Economic Challenges Of Women with Disability: The Case of Women with Mobility disorder and visual Impairment in Hager Tibebe Maderaja Derijit in Addis Ababa*. Master's Thesis Submitted to Addis Ababa University. Available at:

<http://etd.aau.edu.et/handle/123456789/11166>

Employ Abilities (2017). *International Day of Persons with Disabilities*. Available at: <https://employabilities.ab.ca/international-day-of-persons-with-disabilities-december-3-2017-vegreville-ab/> Accessed On October 02, 2019

- [Eric J. M.](#) (2018). Accessibility: measurement and application in transportation planning, *Transport Reviews*, 38(5):551-555.
<https://doi.org/10.1080/01441647.2018.1492778>
- Frehiwot N. (2013). The impact of taxi service zoning on service delivery the case of Yeka, Addis Ababa. MA Thesis Submitted to Addis Ababa University, Ethiopia.
- Grewal I, S. Joy, J. Lewis, K. Swales & K. Woodsfield (2002). Disabled for Life: Attitudes Towards And Experiences Of, Disability in Great Britain. Research Report 173 London: Department for Work and Pensions.
- Henok Tesfaye (2014). Transport Accessibility for People with Physical Impairment in Addis Ababa Unpublished MA Thesis, Addis Ababa University, Ethiopia.
- Hidalgo, D. & C. Huizenga. (2013). Implementation of sustainable urban transport in Latin America. *Research in Transport Economics*, 40(2013): 66-77.
- IDRM (2003a). IDRM Compendium Report: Mexico. Available at:
<https://www.ideanet.org/content.cfm?id=585970&searchit=1> Accessed 10/10/19.
- IDRM (2003b). Compendium Reports: Rights of People with Disabilities. United Kingdom. Available at:
http://www.cirnetwork.org/idrm/reports/compendium/united_kingdom.cfm
- ILO (2013). Ethiopia Country Profile, Employment of PWDs: Inclusion of People with Disabilities in Ethiopia, Geneva, Switzerland.
- Israel D.G. (2013). Determining sample size, University of Florida, p.1-5
- Kothari C.R. (2004). Research Methodology: Methods & Techniques New Delhi: New Age International (P) Ltd. Publishers
- Suen L. & C.G.B Mitchell (1998). Accessible Transportation and Mobility. Institute of Highways and Transportation, United Kingdom.
- Louca-Mai Wilson (2003). An Overview of the Literature on Disability and Transport. Available at: <https://disability-studies.leeds.ac.uk/wp-content/uploads/sites/40/library/wilson-louca-DRCTransportLitreview.pdf>
- Mott MacDonald (2013). Valuing the Social Impacts of Public Transport, U.K. Department for Transport. Available at: <http://bit.ly/1HSKxE>

- Meron Kassahun (2007). Public Transportation System and Its Impact on Urban Mobility: The Case of Addis Ababa. M.A Thesis Submitted to Addis Ababa University, Ethiopia.
- Mononen P., P. Leviäkangas & H. Haapasalo (2017). From internal efficiency to societal Benefits – Multi modal transport safety agency's socio-economic impact analysis. *Research in Transportation Economics*, 66: 78–90. <https://doi.org/10.1016/j.retrec.2017.05.00>
- Muhammad Atiullah Saif, Mohammad Maghrour Zefreh, Adam Torok (2018). Public Transport Accessibility: A Literature Review. *Periodica Polytechnica Transportation Engineering*, 3(2018):1-8. DOI: [10.3311/PPtr.12072-](https://doi.org/10.3311/PPtr.12072-)
- Mulu Eshete (2015). Public Transportation System: The Case of Addis Ababa. A Thesis Submitted to Addis Ababa University, Ethiopia. <http://etd.aau.edu.et/handle/123456789/5724>
- Nyangueso S.O. (2006). An Assessment of Mobility Limitations of the Physically Disabled in Nairobi: A Case Study of Trip to CBD. MA Thesis Submitted to University of Nairobi, Kenya.
- Odufuwa, B.O. (2007). Towards Sustainable Public Transport for Disabled People in Nigerian Cities' Published in *Stud. Home Comm. Studies on Home and Community Science* 1(2): 93-103. DOI: [10.1080/09737189.2007.11885239](https://doi.org/10.1080/09737189.2007.11885239)
- Rahel, A.T. (2017). Evaluation of the Transportation System for Disables versus Policy Implementation in Addis Ababa City. A Thesis Submitted to Addis Ababa University in Partial Fulfillment of the Requirements for the Degree of Master of Science in Road and Transportation Engineering Stream. Available at: <http://etd.aau.edu.et/bitstream/handle/123456789/9691/Rahel%20%20Abebe.pdf?sequence=1&isAllowed=y>
- Raj K. (2007). Towards Sustainable Public Transport for Disabled People in Nigerian Cities. *Stud. Home Comm. Sci.*, 1(2): 93-101.
- Roche A., V. Kostadinov, K. Braye, V. Duraisingam, A. Mcentee, K. Pidd, & R. Nicholas (2018). The New Zealand Addictions Workforce: Characteristics & Wellbeing. Adelaide: National Centre for Education & Training on Addiction, Flinders University.

- Short J. (2002). Mobility of Older and Disabled People Conference on Improving and Implementing Accessibility for People with Reduced Mobility Paris: European Conference of Ministers of Transport.
- SIDA (2014). Disability Rights in Ethiopia: The situation of persons with disabilities. Stockholm, Sweden.
- Steinfeld A. (2011). Universal Design of Automobiles, In Universal Design Book, 2nd Edition. New York: McGraw-Hill.
- Sustainable Development Department. (2013). Improving Accessibility to Transport for People with Limited Mobility (PLM): A Practical Guidance Note.
- Litman, T. (2011). Measuring Transportation Traffic, Mobility and Accessibility, Victoria Transport Policy Institute. Available at: <https://www.vtpi.org/measure.pdf>
- Litman, T. (2017). Transportation Affordability Evaluation and Improvement Strategies. Victoria Transport Policy Institute Victoria.
- Litman, T. (2019). Evaluating Accessibility for Transport Planning Measuring People's Ability to Reach Desired Goods and Activities. Victoria Transport Policy Institute: Victoria.
- Litman, T. (2019). Evaluating Transportation Equity Guidance for Incorporating Distributional Impacts in Transportation Planning 18 March 2019, Victoria Transport Policy Institute: Victoria.
- Litman, T. (2019). Well Measured Developing Indicators for Sustainable and Livable Transport Planning 18 March 2019, Victoria Transport Policy Institute.
- Litman, T. (2019). Evaluating Public Transit Benefits and Costs Best Practices Guidebook, Victoria Transport Policy Institute: Victoria.
- Tessema Eseta (2017). Transport Problems of People with Disabilities and Its Policy Issues: Cases in Addis Ababa.
- EThekweni (2005). Public Transport Plan, eThekweni Transport Authority. Available at: http://www.durban.gov.za/City_Services/ethekweni_transport_authority/Documents/Public%20Transport%20Plan.pdf
- UN (2014). World Urbanization Prospects: Department of Economic and Social Affairs, Population Division, United Nations, New York, United States.

- Stjernborg, V. (2019). Accessibility for All in Public Transport & the Overlooked (Social) Dimension: A Case Study of Stockholm. *Sustainability* 11(2019), 4902: 1-16. Doi:[10.3390/su11184902](https://doi.org/10.3390/su11184902)
- Williams PJG. (2003). Consultation on Transport Aspects of the Disability Discrimination Act. *Access by Design*, 94: 6-9.
- WHO (2011). World Disability Report, Geneva, Switzerland.
- WHO (2011). Valuing the Social Impacts of Public Transport Final Report, Department for Transport, Page 183-184. Geneva, Switzerland.
- WHO (2018). Disability and Health. Available at:<https://www.who.int/news-room/fact-sheets/detail/disability-and-health> Accessed On October 01, 2019.
- WHO (2020). Disabilities: Overview. World Health Organization Regional Office for Africa (WHO). Available at:
<https://www.afro.who.int/health-topics/disabilities>
- World Bank. (2017). Transport for Social Responsibility. Available at:
www.worldbank.org/responsibletransportinclusive_transport_accessibility Accessed on September 20, 2019.
- World Bank Group. (2006). **Factors Influencing Bus System Efficiency**. Available at:
https://ppiaf.org/sites/ppiaf.org/files/documents/toolkits/urbanbus_toolkit/assets/1/1d/1d1.html Accessed On September 30, 2019.